[0011]   FIG. 4 is a flowchart illustrating the operation of the DVR when performing

error recovery according to one embodiment; and

[0012]   FIG. 5 is a flow chart illustrating further details of the "execute recovery

procedures" step of FIG. 4.

[0013]   The figures depict an embodiment of the present invention for purposes of

illustration only. One skilled in the art will readily recognize from the following

description that alternative embodiments of the structures and methods illustrated herein

may be employed without departing from the principles of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0014]   FIG. 1 is a high-level block diagram illustrating an environment 100

containing a digital video recorder (DVR) 110. The DVR 110 is representative of a

typical consumer electronic device. As used herein, the phrase "consumer electronic

device" refers to a device typically installed in a home or other consumer environment.

In addition to DVRs, typical consumer electronic devices include video cassette recorders

(VCRs), televisions, personal computers, DVD players, etc. Other forms of consumer

electronic devices include cellular telephones, pagers, portable music players, personal

digital assistants (PDA), portable computers, portable GPS receivers, etc. The phrase

"consumer electronic device" also includes devices not typically utilized by a

"consumer," such as professional-grade devices. In a preferred embodiment, the

consumer electronic device is a DVR.

[0015]   The DVR 110 may be a separate device, or incorporated into other devices

such as personal computers, set-top boxes (STBs), and televisions. The DVR 110

preferably receives television content 112 broadcast by a television broadcaster or

delivered via a computer network. The phrase "television content" is utilized herein

because the DVR 110 is preferably used for storing and viewing television programs.

However, the phrase includes any other form of content with which the DVR 110 may be

utilized, including, for example, audio, streaming data, etc. The DVR 110 may receive

the content via an antenna, a coaxial cable, a direct input, a computer network, etc. The

DVR 110 preferably digitizes (if necessary) and stores selected television content 112 and

plays it back for display on a television 114.

[0016]   The DVR 110 is preferably connected via a network connection 116 to the

Internet 118 or another network. A diagnostic/repair server 120 (hereafter "diagnostic

server") and a channel guide/software server 122 (hereafter "software server") are in

communication with the DVR 110 via the Internet 118. The DVR 110 can use any

known networking technology to access the Internet 118. In one embodiment, the

network connection 116 connects the DVR 110 to the Internet 118 via a telephone

network. In other embodiments, the network connection 116 utilizes Ethernet or some

other networking technology to couple the DVR 110 to the Internet 118. As known in the

art, the Internet 118 typically contains one or more servers or networks through which

data to/from the DVR 110 may pass. For example, in one embodiment the DVR 110

connects to an Internet Service Provider (ISP) (not shown) that provides Internet access

enabling the DVR to communicate with the diagnostic 120 and software 122 servers. In

addition, the network topology varies in alternative embodiments and may utilize direct

connections or private networks instead of the Internet 118. In one embodiment, for

example, the DVR 110 utilizes a modem and telephone network to connect directly to the

diagnostic server 120 and/or software server 122. In another embodiment, the DVR 110

receives data from one or more of the servers 120, 122 via the television content 112. For

example, the data may be received via a coaxial cable that carries both Internet data and

television content, or received via the vertical blanking interval (VBI).

[0017]   The diagnostic server 120 preferably interacts with the DVR 110 to diagnose

and identify likely solutions to problems in the DVR 110. The DVR 110 may contact the

diagnostic server 120 in response to a user command and/or automatically (i.e., without

human intervention). For example, a user of the DVR 110 may notice that the DVR is

not operating normally and cause it to contact the diagnostic server 120 by holding down

a particular button for an extended length of time or selecting a particular menu option

from an on-screen menu. In another example, the DVR 110 may detect that it is

encountering errors while digitizing, storing, and/or playing back the television content

and automatically contact the diagnostic server 120 to diagnose the problem 120. The

behavior of the diagnostic server 120 is described in more detail below.

[0018]   The software server 122 preferably provides channel guide data and

application software to the DVR 110. The channel guide data are preferably tied to the

television content 112 and include information such as program titles, start times, end

times, channel information, and other data, such as ratings, descriptions of shows, names

of actors and directors, etc. Preferably, the channel guide data are obtained from a